

WHAT IS CLAIMED IS:

1. A flexible insulation blanket having an outer ceramic matrix composite layer with a smooth surface, said blanket comprising:  
5 an outer ceramic matrix composite (CMC) layer comprised of  
a ceramic fabric;  
a monazite ceramic matrix material incorporated in and around the  
fibers of the ceramic fabric;  
an inner ceramic fabric layer; and,  
10 a batting layer provided between the outer and inner layers;  
wherein the outer layer, batting, and inner layer are quilted together to form a  
unitary blanket.
2. The blanket of Claim 1, wherein the outer ceramic fabric is comprised  
15 of multiple plies of fabric.
3. The blanket of Claim 1, wherein the ceramic fabric is woven from  
aluminoborosilicate, alumina, mullite, and silicon carbide.
- 20 4. The blanket of Claim 3, wherein the outer ceramic fabric layer is  
woven from an aluminoborosilicate fiber.
5. The blanket of Claim 1, wherein the outer ceramic fabric layer has a  
thickness of about 0.01 inches to 0.06 inches.  
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6. The blanket of Claim 1, wherein the batting is composed of ceramic  
selected from alumina, silica, mullite, zirconia, or a combination thereof.
7. The blanket of Claim 1, wherein the inner ceramic fabric is woven  
30 from fibers selected from aluminoborosilicate, alumina, mullite, S-glass, and E-glass.
8. The blanket of Claim 1, wherein the monazite ceramic matrix material  
contains an emissivity agent.

9. The blanket of Claim 8, wherein the emissivity agent is SiC.

10. The blanket of Claim 1, wherein the edges of the outer fabric layer are  
5 turned toward the inner surface of the blanket such that the edges of the outer fabric  
layer cover at least a portion of the edge of the blanket.

11. A method of producing a flexible insulation blanket having a ceramic  
matrix composite infiltrated layer with a smooth surface, said method comprising:  
10 layering, respectively, an outer ceramic fabric layer, a batting layer, and a  
inner ceramic fabric layer;  
quilting said layers to form a flexible insulation blanket;  
infiltrating said outer fabric layer of said blanket with a monazite based pre-  
ceramic slurry;  
15 compressing the blanket in the direction of thickness of the blanket by  
applying pressure to said outer layer of the blanket with a smoothly surfaced plate;  
curing said pre-ceramic slurry; and  
sintering the infiltrated outer ceramic layer to form a ceramic matrix  
composite layer.

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12. The method of Claim 11, wherein the outer ceramic fabric layer is  
comprised of multiple plies of fabric.

13. The method of Claim 11, wherein the ceramic fiber is selected from  
25 aluminoborosilicate, alumina, mullite and silicon carbide.

14. The method of Claim 13, wherein the outer ceramic fabric layer is  
woven from an aluminoborosilicate fiber.

15. The method of Claim 11, wherein the outer ceramic fabric layer has a  
30 thickness of about 0.01 inches to 0.06 inches.

16. The method of Claim 11, wherein the batting is composed of ceramic selected from alumina, silica, mullite, zirconia, or a combination thereof.

17. The method of Claim 11, wherein the inner ceramic fiber layer is  
5 woven from fibers selected from aluminoborosilicate, alumina, and mullite, S-glass, and E-glass.

18. The method of Claim 11, wherein the pre-ceramic slurry is infiltrated within the outer fabric layer of the blanket by soaking the fabric within the slurry.  
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19. The method of Claim 11, wherein the pre-ceramic slurry is infiltrated within the outer fabric layer of the blanket by applying the slurry by brushing, spraying, or sponging.

20. The method of Claim 11, wherein the pre-ceramic slurry is a  
15 suspension of  
15-45% solids, and  
the remainder water,  
wherein the solids are composed of 60-100% monazite particulates and 0-40%  
20 SiC particulates.

21. The method of Claim 11, wherein said slurry has a ceramic component and a solvent component, and wherein the method further comprises the step of allowing the solvent component of the pre-ceramic slurry to evaporate, resulting in a  
25 slurry with a paste-like consistency, prior to compression of the blanket.

22. The method of Claim 11, further comprising the step of applying a releasing agent to the outer surface of the infiltrated fabric layer prior to compressing the blanket.  
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23. The method of Claim 11, wherein the step of curing the pre-ceramic slurry occurs between about 300°F and about 500°F.

24. The method of Claim 23, wherein the step of curing occurs at about 350°F.

25. The method of Claim 11, wherein the step of sintering the ceramic matrix occurs at between about 1800°F and 2400°F for a time period of about 15 minutes to 5 hours.

26. The method of Claim 25, wherein the step of sintering occurs at a temperature about 2200°F for about 1 hour.

27. The method of Claim 11, further comprising the step of turning the edges of the fabric layer toward the inner surface of the blanket such that the edges of the outer fabric layer cover at least a portion of the edge of the blanket.

28. The method of Claim 11, further comprising releasing said compression between said curing and sintering steps.

29. A method of constructing a ceramic matrix composite (CMC) infiltrated flexible insulation blanket having a smooth surface, comprising:

laminating an outer ceramic fabric layer, a batting layer, and an inner ceramic fabric layer;

sewing the laminate to form a quilted blanket having an outer surface corresponding to the outer fabric layer and an inner surface corresponding to the inner fabric layer;

applying an uncured monazite based ceramic matrix material to the outer surface of the blanket;

placing the blanket under pressure in the direction of thickness of the blanket;

curing said ceramic matrix material to form a CMC layer with the outer fabric layer of the blanket;

releasing said pressure; and

sintering the CMC layer of the blanket.

30. The method of claim 11, wherein the step of sintering the infiltrated outer ceramic layer is accomplished using radiant heat directed mainly at the surface of the outer layer of the blanket.